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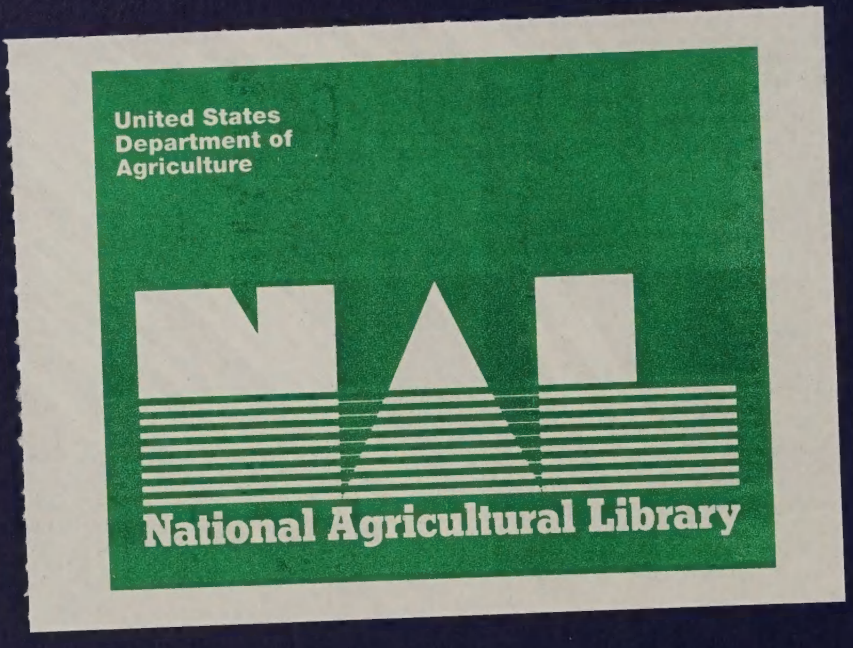
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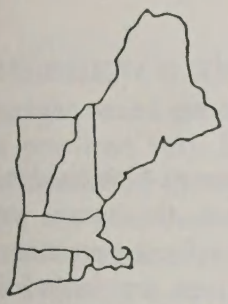

A Cooperative Extension Publication,

1996 NEW ENGLAND GUIDE TO WEED CONTROL IN CORN

AUG 3 1 1998
CATALOGING PREP.

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All pesticides listed in this bulletin are registered and cleared for suggested uses according to Federal registration and state laws and regulations in effect on December 1, 1995.

A. **NOTICE:** It is unlawful to use any pesticide for other than the registered use. **READ AND FOLLOW THE LABEL.** User assumes all responsibilities for use inconsistent with the product label.

B. **WARNING:** Pesticides are poisonous. Read and follow the directions and safety precautions on labels. Handle carefully and store in original labeled containers out of reach from children, pets and livestock. Dispose of empty containers as required by your state regulations. Do not contaminate soil, forage, other crops, or water sources. See telephone directory for location of your nearest **POISON INFORMATION CENTER.**

C. Persons using a *Restricted Use* pesticide must be certified in conformity with standards set forth by state and Federal regulations. **LASSO, DUAL, PRINCEP, BLADEX, atrazine,** and **GRAMOXONE EXTRA** are classified as *Restricted Use* herbicides in all states. Other herbicides may be *Restricted Use* in certain states.

HERBICIDE-RESISTANT WEED MANAGEMENT

There are a number of factors to consider when developing a weed management program that fits your farming operation. When choosing a herbicide program, decisions should be based on potential weed problems, crop and herbicide rotation, injury potential, tillage system and available application equipment, soil texture and organic matter, potential environmental hazards and cost. One common problem farmers have noticed is that many of their old standard herbicide programs have been less effective in recent years. When herbicide rates were increased the weed problems remained. Most of these problems are due to herbicide resistance. Resistance describes a condition whereby a plant's growth is not affected by a herbicide application. The occurrence of herbicide-resistant weeds has been on the increase during the past decade. Herbicide resistance in weeds has reached a serious level in many agricultural areas around the world. **Presently at least 55 species of weeds have been documented with resistance to triazine herbicides. Aproximately 100 weed species have been reported to possess resistance to one family of herbicides or another.** Increases in triazine resistant weeds in field corn in New England has increased herbicide use on many farms. Practices that increased the probability of triazine resistant weeds in New England included: 1. Fields were in continuous corn; 2. All fields were continuously treated with atrazine year after year; 3. Use of postemergence herbicides were not common; 4. Cultivation was rare; and 5. Most of the corn acreage is continuously used for silage and manure from corn silage fed to cows was returned to the field.

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HERBICIDE-RESISTANT WEED MANAGEMENT - continued

Management strategies to minimize further development of herbicide-resistant weeds includes:

SCOUTING: Scout fields regularly to identify problem weeds. Respond quickly to changes in weed populations to restrict the spread of plants that may have developed resistance. Fields should be scouted at least two times a year. **Corn fields should be scouted when the corn is 3 to 4 inches tall in order to determine the need for additional weed control such as cultivation or for use of postemergence herbicides.** Scouting at the end of the season can help make decisions about future weed control measures particularly if preemergence herbicides will be used the following year. Choose the right management strategy for weed control before the season starts. If you know from past years which weeds need controlling and have scouted fields during the past growing season you should have enough information to select the best management strategy suited to the weed problem.

MECHANICAL CONTROL: Mechanical weed control can be an important component of many weed control programs. Cultivation cannot be substituted for chemical controls, where reduced till and no-till cropping systems are practiced. Where selective cultivation is possible, however, the use of a rotary hoe, spring tine or rolling cultivator, shovel (sweep) cultivator or similar implements will aid in reducing the potential for development of herbicide resistant weeds.

If selective cultivation is used, it should be done early. Rotary hoes and spring tine cultivators are effective for controlling small weeds (less than 1 inch tall), and should be operated at a relatively high speed (7 to 10 mph) on a fairly dry soil. For maximum effectiveness a rotary hoe should be used when the weeds are just emerging from the soil. Cultivation with a shovel, sweep, or rolling cultivator is more effective on larger weeds than a rotary hoe, and can also be effective when weeds are very small.

CROP ROTATION: A key management stategy to combat weeds is crop rotation. Certain weeds are commonly associated with certain crops. Rotating a crop can help reduce certain weeds that may become a problem under continuous cropping systems.

HERBICIDE ROTATION: When crop rotation is not feasible, a viable alternative for weed resistance management would be to rotate herbicides from different families with different modes of action. Making more than two consecutive applications of herbicides with the same mode of action against the same weed may increase the probability of developing resistance unless other effective control practices are included in the management system. Combinations of herbicides that include multiple modes of action will prevent an increase in herbicide resistant weeds.

With the recent registration of a number of new corn herbicides the use of both preemergence and postemergence herbicides in rotation will reduce the potential for development of herbicide-resistant weeds. When using herbicide resistant and herbicide tolerant crops, more than two consecutive applications of herbicides with the same mode of action should not be used against the same weed unless other effective control practices are included in the management system. Refer to Table 5, *Resistence Potential of Field Corn Herbicides According to Mode of Action* for assistance in forming new weed management strategies.

TRIAZINE SPECIAL REVIEW

The triazines are one class of herbicides that has been subjected to use restrictions within the past few years in order to minimize potential adverse effects on ground and surface water quality. The Environmental Protection Agency (EPA) initiated a Special Review of the triazine herbicides that includes atrazine, cyanazine (BLADEX) and simazine (PRINCEP). This process allows the EPA to review additional evidence and reports associated with the benefits and risks of this group of pesticides for which the agency has already granted a registration.

DuPont Agricultural Products announced on August 2, 1995, that it was changing the label on cyanazine, to reduce the amount of active ingedient used per acre. DuPont also announced it will stop selling the herbicide in 1999 and that all use in the U.S. will stop at the end of 2002. The company chose to phase out its herbicides, BLADEX and EXTRAZINE II, rather than risk the potential disruption to customers through changes in the use restrictions or a full cancellation.

Ciba Crop Protection, manufacturer of atrazine and simazine had decided to continue its commitments to these two products. The company indicated its confidence in the safety of these herbicides when applied following the label restrictions currently in place. EPA expects to make a preliminary decision on atrazine and simazine in 1996. A final decision is not expected until 1997.

POSTEMERGENCE HERBICIDES

Postemergence weed control for corn in New England has been practiced very little due to both the lack of materials available in past years, and the lack of knowledge and confidence by farmers concerning these herbicides. The number of new postemergence herbicides currently available has significantly increased. Use of postemergence herbicides presents the opportunity to withhold preemergence treatments that are preventative in nature until weeds emerge, determine the weed species present, and select the herbicide and rate required according to the situation. These herbicides are not broadspectrum but are highly selective on certain weed species. Therefore, when using postemergence herbicides, appropriate scouting information for weeds is necessary. Such information will target the best time to control weeds based on herbicide efficacy and the length of time key weeds can remain in the crop without causing economically important reductions in yields. Effective scouting enables optimization of the rate and timeliness of the herbicide treatments. This concept offers significant advantages in herbicide savings but has not been a widely adopted grower practice either due to time constraints from other farming operations, fear of not being able to return to the field at the appropriate time of application due to unfavorable weather conditions, or the need to change field planting patterns to avoid running over corn when applying postemergence treatments.

Most of these herbicides also offer an environmental advantage due to the low use rates. Furthermore, many are prepackaged and, thus, would greatly reduce the likelihood of incorrect application rates and spills associated with mixing of materials. Use of these low dose compounds will substantially lower the total amount of herbicide needed for weed control. Due to the large number of new postemergence herbicides now available it may be possible to use only postemergence products for weed control on many fields in the future. Farmers going this route will need to closely manage their program, particularly where grass weeds are present.

HERBICIDE RESISTANT FIELD CORN OPTIONS

Herbicide manufacturers and seed companies have joined forces to commercialize corn hybrids that can be used with certain herbicides. This allows growers to have another tool for weed management. With herbicide resistant corn comes more postemergence herbicides options that allows more selectivity when problems occur. The use of newer and safer chemistry without concern for residual activity or groundwater contamination is an important grower option. IMI-corn refers to imidazolinone resistant (IR) or tolerant (IT) corn. This allows the use of the imidazolinone herbicide, Pursuit, on corn. Pursuit controls a wide range of annual grass and broadleaf weed species. Pursuit 2AS is applied at 4 fluid ounces per acre (1/4 pint) for all methods of application: early preplant, preplant incorporated, preemergence and postemergence (including minumum and no-till). Connecticut weed control trials in 1994 and 1995 have shown excellent control of large crabgrass, fall panicum, giant foxtail, common lambsquarter, redroot pigweed, and velvetleaf was obtained with Pursuit applied either preemergence or early postemergence. Good suppression of common ragweed was also obtained with early postemergence applications of Pursuit, however, a tank mix with either Banvel or Clarity at 1/4 pint resulted in superior control of common ragweed. Available premixes of Pursuit with other herbicides include Contour, a combination of Pursuit and atrazine, and Resolve, a combination of Pursuit and dicamba. Commercial hybrids are available.

Sethoxydim resistant corn hybrids (SR-corn) have also been developed. Sethoxydim is the active ingredient in Poast herbicide which is currently being evaluated alone and in combination with other herbicides for weed control with these new hybrids. Use of sethoxydim resistant corn hybrids will allow Poast to be used for postemergence grass weed control in corn. Commercial hybrids are expected to be available during the 1996 growing season. Glufosinate-resistant or Liberty Link corn hybrids (GR-corn) are another new development. Glufosinate is the active ingredient in Liberty herbicide. LibertyLink hybrids (GR-corn) may be available in 1997. Corn hybrids resistant to Roundup (glyphosate) and other herbicides are being developed.

INCREASING CORN PLANT POPULATIONS AND NARROW ROW PLANTINGS FOR WEED MANAGEMENT

Field corn competes with weeds for light, water, and nutrients. Herbicides are needed to control weeds primarily during the period before the corn leaf canopy closes. The relative competitive ability of field corn can be enhanced by increasing plant population. Faster canopy closure with higher plant populations will mean less herbicide than significantly recommended. Studies have shown that field corn planted in 15 inch rows had greater silage and grain yields than corn planted in 30 inch rows. In addition, field corn planted in 15 inch rows required significantly less herbicide for effective weed control than in the 30 inch rows. In one study herbicides were cut 75 percent on no-till cornfields without sacrificing yields when the number of corn plants were doubled by narrowing the row spacing from 30 to 15 inches. Increasing plant populations in corn fields in either 30 or 15 inch rows may enable a reduction in the rate of herbicide required for effective weed control but may require changes to existing harvesting equipment.

PROTECTING GROUND AND SURFACE WATER

Nationwide studies continue to show the potential for groundwater contamination by herbicides may be greater than was commonly believed a decade ago. Concerns involving herbicides in groundwater, have substantially heightened public awareness regarding the safety of the water for drinking and other domestic uses. This problem particularly raises public concern in the Northeast where agricultural and suburban areas are situated in close proximity to one another. Contamination may pose health risks to certain individuals. In such cases, alternate water sources must be found or filtration systems must be used. Property values will generally decline when domestic water sources are contaminated with pesticides. Alternative weed management practices which significantly reduce the use of herbicides with high risk potential for soil leaching or runoff in watershed areas will likely reduce the potential for future contamination of ground and surface waters. Use of herbicides with lower leaching potential, choosing the lowest dosage rates based on soil texture and organic matter content, use of cultivation where possible, and increasing the adoption of new weed control technologies such as use of either postemergence herbicides on standard corn hybrids or herbicide tolerant hybrids will provide effective, economical and environmentally sound weed management alternatives in field corn. The effect of herbicides on water quality will continue to be a major public issue.

USING IPM STRATEGIES FOR EFFECTIVE, ECONOMICAL, AND ENVIRONMENTALLY SOUND WEED MANAGEMENT

There are a number of factors to consider when developing a weed management program. Program decisions should be based on potential weed problems, crop and herbicide rotation, injury potential, tillage system, available application equipment, soil texture and organic matter, potential environmental hazards and cost. Increases in the cost of herbicides coupled with the environmental concerns regarding agricultural chemicals have placed additional burdens on production costs and agricultural viability. Financial hardships currently facing many farmers have led to considerations that farm profitability might be increased by reducing the rate or use of herbicides if effective, less costly alternatives were available. Integrated Pest Management (IPM) strategies can provide growers with effective weed control yet reduce the amount of herbicides required to provide this control. IPM plays an important role in protecting water resources. Regular monitoring of crop conditions and weed populations helps a producer make the most informed production decision. Herbicide applications based on economic thresholds optimize grower profits while reducing environmental hazards.

Effective herbicide management depends upon weed size, weed species identification and soil moisture. Herbicide selection and rate can be substantially adjusted as these parameters change. Significant rate reductions are possible if a susceptible species predominates in a field and the correct herbicide is used to control the problem weed. A high level of weeds producing seeds during the growing season will likely lead to undesireable weed levels in subsequent years. However, on many fields, weeds have decreased as a result of efficient weed control and competive crops. As a consequence, the amount of herbicides can be reduced substantially.

When manufacturers develop herbicide label rates, they choose the rate possible that will control weeds under a variety of conditions. Little information has been previously available in New England on the use of reduced herbicide rates to lower the impact of herbicides on production costs and environmental contamination. Connecticut IPM weed control trials have shown that significantly reduced rates work better under favorable weather conditions, but in the drought years, many herbicides, particularly soil applied herbicides may not provide effective weed control even at labeled rates. That's not to say the herbicide labels are wrong. Herbicide labels provide optimum use rates for each soil type under favorable growing conditions. Depending on the particular herbicide or weed problem, maximum labeled use rates may be needed. Custom applicators and dealers generally recommend combinations of herbicides at listed labeled rates since they are responsible for following up with that farmer and taking care of any possible problems. It would be tough for the dealer to carry the weight of reduced rate recommendations. They are just safer sticking with the manufacturer's labeled rate.

The focus of the Connecticut IPM Field Corn Program is to show growers that the same degree of weed control can be obtained with the lower use rates as the full labeded rates, particularly when more than one herbicide is necessary for broadspectrum weed control. Connecticut IPM weed trials have shown reduced herbicide rates are effective under a wide variety of weed density and weather conditions. In many studies, half the labeled use rates of a number of herbicide combinations for field corn provided the same degree of weed control as the full use rates. Its not as simple as just using less. Extensive research and experimentation is involved to provide reduced rate herbicide recommendations. For more information regarding effectiveness of reduced rate combinations contact Dr. Frank Himmelstein, University of Connecticut Cooperative Extension System, 24 Hyde Avenue, Vernon, CT. 06066. (860) 875-3331.

Table 1. Relative effectiveness of some common corn herbicides

	Burcucumber	Jimsonweed	TR[1] Lambsquarters	TR[1] Pigweed	Ragweed	Velvetleaf	Barnyardgrass	Crabgrass	Fall Panicum	Foxtails	Johnsongrass	Quackgrass	Nutsedge
PREEMERGENCE													
ATRAZINE	P	G/E	N	N	G/E	F/G	P/F	P/F	P	F	N	F	P
BLADEX	N	G/E	N	N	G/E	F	G	F/G	F/G	G	P	N	P
DUAL	N	N	N	F/G	P	N	G/E	G/E	G	G	P	N	F
FRONTIER	N	N	N	F/G	P	N	G/E	G/E	G	G/E	P	N	F
HARNESS	N	N	F/G	G/E	F	P	G/E	G/E	G/E	G/E	P/F	N	F
LASSO MT	N	N	F	G	P	N	G/E	G/E	G	G/E	P	N	F
SURPASS	N	N	F/G	G/E	F	P	G/E	G/E	G/E	G/E	P/F	N	F
PRINCEP	P	G/E	N	N	G/E	F/G	G	F/G	G	F/G	P	P/F	F
PROWL	N	P	G/E	G/E	P	G/E	G	G/E	G	F/G	P/F	N	P
BROADSTRIKE +DUAL	N	F/G	F/G	G	F	G/E	G/E	G/E	G	G	P/F	N	F
POSTEMERGENCE													
ACCENT	F/G	P/F	F	G/E	P	F	G	F/G	G/E	G/E	E	G/E	P
ATRAZINE	G	G/E	N	N	G/E	F/G	F	P	P	F	N	F	F/G
BANVEL	F/G	G/E	G/E	G/E	G/E	F/G	N	N	N	N	N	N	N
BASAGRAN	P	G/E	F/G	F	F/G	G	N	N	N	N	N	N	F/G
BEACON	G	G/E	F/G	G/E	E	G	P	P	F/G	P/F	E	G	P
BLADEX	N	F/G	N	N	G/E	F/G	G	F/G	F/G	F/G	P	P	P
BUCTRIL	F/G	G/E	G/E	F	F	G	N	N	N	N	N	N	N
EXCEED	G	G/E	G/E	G/E	E	G	P	P	P	P/F	P/F	P/F	P
PERMIT	F	F/G	P/F	G/E	G/E	G/E	N	N	N	N	N	N	G/E
RESOURCE	F	F/G	G/E	G/E	F/G	G/E	N	N	N	N	N	N	N
STINGER	N	F/G	P	P	E	P	N	N	N	N	N	N	N
TOUGH	P	F/G	G/E	G/E	P/F	P/F	N	N	N	N	N	N	F/G
2,4-D	P	F/G	G/E	G/E	G/E	F/G	N	N	N	N	N	N	N
PREPLANT INCORPORATED													
ERADICANE	N	P	P/F	F/G	P	P/F	G/E	G/E	G/E	G/E	G	P/F	G/E
SUTAN	N	P	P	F/G	P	P/F	G/E	G/E	G/E	G/E	G	N	G/E

[1]TR=triazine resistant, N=no control, P=poor control, F=fair control, G=good control, E=excellent control.

The table above represents the relative effectiveness of herbicides on individual weeds. Effectiveness ratings are based on labeled application rates and correct weed size and stage of growth. Results may differ with variations in weed size, temperature, soil or water ph, or adverse rainfall and soil moisture conditions. Combinations of two herbicides are often necessary to improve the spectrum of weeds controlled. Connecticut weed control trials have shown below labeled rates of herbicides in tank mixtures may result in similar weed control as the labeled tank-mix rates.

SPECIFIC WEED PROBLEMS IN CORN

WEED SITUATION	PRODUCT AND RATE/ACRE [1]	
I. CRABGRASS, FALL PANICUM, AND OTHER ANNUAL GRASSES		
	DUAL 8E	1.5 - 2 pts.
	FRONTIER 7.5EC	1 - 1.25 pts.
	HARNESS 7EC	1.75 - 2 pts.
	LASSO MT 4ME	3.5 - 4.0 pts.
	PROWL 3.3EC	3 - 3.6 pts.
	SURPASS 6.4EC	2 - 2 1/4 pts

Comments and cautions: Dual, Frontier, Harness, Lasso, and Surpass will not control emerged weeds at time of planting. Prowl may be applied preemergence to early postemergence up to the 4-leaf stage of corn, and weeds are no more than 1 inch tall. Corn must be planted at least 1.5 inches deep to avoid Prowl injury. Do not incorporate Prowl.

II. ESCAPED ANNUAL GRASSES/ POSTEMERGENCE ANNUAL GRASS CONTROL OPTIONS	ACCENT 75WDG	2/3 oz
	BEACON 75WDG	0.76 oz

Comments and cautions: For best results, apply Accent when annual grass weeds such as barnyardgrass, fall panicum, and foxtails are no more than 2-4 inches tall (1-5 leaves) prior to tillering. Accent has provided effective crabgrass control in Connecticut field trials when applied soon after emergence, (1-4 leaves) prior to tillering. Crabgrass control may be significantly reduced with Accent as the plant matures. **Fall panicum is the only annual grass weed controlled with Beacon when applications are made to fall panicum less than 2 inches tall, 2-3 leaves.** Accent or Beacon applications should include either a crop oil concentrate applied at 1 gallon per 100 gallons of spray solution or a nonionic surfactant (1 qt/100 gal). Accent or Beacon should be applied when the corn is 4-24 inches in height or with drop nozzles if corn is too tall. Read herbicide label regarding herbicide or insecticide combinations.

III. TRIAZINE-RESISTANT LAMBSQUARTERS	BROADSTRIKE+DUAL 7.67EC	1.75 - 2 pts.
	HARNESS 7EC	2 pts.
	PROWL 3.3EC	3 - 3.6 pts.
	SURPASS 6.4EC	2 1/4 pts.

Comments and cautions: Broadstrike+Dual has displayed crop injury under cold wet conditions particularly on sandy-gravelly soils. Injury has also occurred in soils with pH <5.9 with high organic matter, high soil pH (>7.8), and when in-furrow insecticide applications are used. See comments for Prowl in Section I.

IV. TRIAZINE-RESISTANT PIGWEEDS	BROADSTRIKE+DUAL 7.67EC	1.75 - 2 pts.
	DUAL 8E	1.5 - 2 pts.
	HARNESS 7EC	1.75 - 2 pts.
	LASSO MT 4ME	3.5 - 4 pts.
	PROWL 3.3EC	3 - 3.6 pts.
	SURPASS 6.4EC	2 - 2 1/4 pts.

Comments and cautions: See comments for Broadstrike+Dual in Section III. See Comments for Dual, Harness, Lasso, Prowl and Surpass in Section I.

1The application rates suggested in this section are based on average conditions for fine sandy loam soils (coarse) with over 3% organic matter. On fields with finer textured soils (medium and fine), higher rates of some herbicides may be needed. The application rates given for each herbicide are for a specific weed problem when applied alone. Combinations of two herbicides may be needed to achieve control of both grass and broadleaf weeds. The lower rates are generally suggested when tank mixtures are needed. Refer to the product for the appropriate rates. Some products listed may not be registered in all of the New England States. Only use products registered in your State. The following table gives only one formulation for each product listed. Some products may have more than one type of formulation. Choose the formulation that best fits your weed control program. Do not exceed the labeled rates for a given soil type, since crop injury may occur.

SPECIFIC WEED PROBLEMS IN CORN-continued

WEED SITUATION	PRODUCT AND RATE/ACRE	
V. VELVETLEAF	BROADSTRIKE+DUAL 7.67EC	1.75 - 2 pts.
	PROWL 3.3EC	3 - 3.6 pts.

Comments and cautions: See comments for Broadstrike+Dual in Section III. See Comments for Prowl in Section I.

VI. COMMON RAGWEED, JIMSONWEED, SMARTWEED, COCKLEBUR	ATRAZINE 4L	2 - 3 pts.
	BLADEX 90DF	1.3 - 2.2 lbs.

Comments and cautions: Atrazine may be applied pre or postemergence. Applications postemergence should include an emulsifiable oil or oil concentrate at 2 pts/acre. Read all use restrictions and safety precautions. Bladex may be applied preemergence through the 4-leaf stage of corn, but before weeds exceeed 1 1/2 inches in height. For non-triazine alternatives, herbicides listed in Section VII can be used.

VII. ESCAPED ANNUAL BROADLEAF WEEDS/POSTEMERGENCE ANNUAL BROADLEAF CONTROL OPTIONS	BANVEL 4S	0.5 - 1 pt.
	BEACON 75WDG	0.76 oz.
	CLARITY 4S	0.5 - 1 pt.
	2,4-D AMINE 4S	0.5 - 1 pt.
	EXCEED 57WDG	1.0 oz.
	PERMIT 75WDG	2/3 oz
	RESOURCE 0.86EC	4 - 6 fl. oz.

Comments and cautions: For best control apply Banvel or Clarity when weeds are less than 3 inches tall. May use the higher rate of both herbicides until corn is 5 inches. When corn is 5-36 inches use no more than the 0.5 pt rate. Beacon will provide good control of a number of broadleaf weeds when weeds are 1-4 inches at the time of application. Beacon will control common ragweed at 2-9 inches in height. Follow adjuvant options and other precautions for Beacon as described in Section II. 2,4-D Amine may only be applied on corn from 4-8 inches in height. If corn is over 10 inches tall use directed spray with drop nozzles. Permit, at the 2/3 oz rate, will control redroot pigweed at 1-3 inches, common ragweed and velvetleaf at 1-9 inches. Higher rates are required for more mature weeds. Permit can be applied to corn from spike through the canopy stage, typically before the crop is 20 to 30 inches tall. Use a nonionic surfactant at 1 to 2 quarts per 100 gallons of spray solution or crop oil concentrate at 1 gallon per 100 gallons of spray solution. Resource is most effective for common lambsquarters, and smooth pigweed when treated at the 2-4 leaf stage. Velvetleaf may be treated up to the 6 leaf stage at rates to 6 fl. oz. Rates higher than 6 fl. oz will require drop nozzles but will control more mature weeds. Resource should not be applied after the 10 leaf stage of corn. A crop oil concentrate at the rate of 1 pint per acre should be included. Combinations of reduced rates of Beacon, Permit or Resource with either Banvel, or Clarity will increase the spectrum and size of weeds controlled with these products.

VIII. HEDGE BINDWEED, HORSENETTLE, CANADA THISTLE	2,4-D AMINE 4S	0.5 - 1 pt.
	BEACON 75WDG	0.76 oz.
	BANVEL 4S	0.5 - 1 pt.
	CLARITY 4S	0.5 - 1 pt.

Comments and cautions: See comments for Banvel, Clarity and 2,4-D Amine under Section VII. Beacon offers suppression and/or partial control of these species. Combinations of Beacon with either Banvel, Clarity or 2,4-D Amine will increase the spectrum and size of weeds controlled with these products.

SPECIFIC WEED PROBLEMS IN CORN-continued

WEED SITUATION	PRODUCT AND RATE/ACRE	
IX. BURCUCUMBER, WILD CUCUMBER	ATRAZINE 4L	2 pts.
	ACCENT 75 WDG + ATRAZINE 4L	2/3 oz + 1-2 pts
	BEACON 75 WDG + ATRAZINE 4L	0.76 oz + 1-2 pts.
	EXCEED 57WDG + ATRAZINE 4L	1.0 oz + 1-2pts.
	LADDOK S-12 5F	2 1/3 pts.
	MARKSMAN 3.2L	3.5 pts.
	PERMIT 75WDG + ATRAZINE 4L	2/3 oz - 1 oz + 1-2 pts.
	RESOURCE 0.86EC + ATRAZINE 4L	4 - 6 fl oz + 1-2 pts.

Comments and cautions: Atrazine should be applied postemergence with an emulsifiable oil or oil concentrate at 2 pts/acre.To avoid corn injury, apply before corn exceeds 5 leaf stage of growth for Marksman, or 12 inches tall for Laddok. Accent, Beacon, and Exceed combinations should be applied when corn is 4-24 inches in height or with drop nozzles if corn is too tall. Permit should be applied to burcucumber between 4 and 12 inches in height. Resource should be applied to burcucumber at the 2 leaf stage of the weed. Accent, Beacon, Exceed, Marksman and Permit applications should include either a crop oil concentrate applied at 1 gallon per 100 gallons of spray solution or a nonionic surfactant (1 qt/100 gal). Laddok applications should be applied to Burcucumber at the 3 leaf stage of the weed and should include 2 pt/A of a crop oil concentrate or Dash. Read herbicide label regarding herbicide or insecticide combinations. See comments for Permit and Resource in Section VII.

X. QUACKGRASS	ACCENT 75WDG	2/3 oz
	BEACON 75WDG	0.76 oz
	ROUNDUP 4S	2 - 4 pts
	RANGER 2.7S	1 - 6 pts

Comments and cautions: Apply Accent or Beacon when quackgrass is 4-10 inches tall. Follow adjuvant options and other precautions for both Beacon and Accent as described in Section II. Roundup or Ranger can be applied in the fall after harvest or in the spring before planting to actively growing foliage 8-12 inches in height. If using the 2 pt rate of Roundup, add 0.5% nonionic surfactant of total spray volume in no more than 10 gallons per acre. If using 4 pts of Roundup, apply in 10-40 gallons of water per acre. Do not till between harvest and fall applications or in the fall or spring prior to spring application. Allow 3 or more days after application before tillage.

XI. SHATTERCANE, SEEDLING AND RHIZOME JOHNSONGRASS	ACCENT 75WDG	2/3 oz
	BEACON 75WDG	0.76 oz

Comments and cautions: Apply when shattercane and seedling Johnsongrass are 4-12 inches or rhizome Johnsongrass is 8-18 inches tall. Follow adjuvant options and other precautions for both Beacon and Accent as described in Section II.

XII. YELLOW NUTSEDGE	BASAGRAN 4S	1.5 - 2 pts.
	DUAL 8E	2 pts.
	LADDOK S-12 5F	2 1/3 pts.
	SUTAN+ 6.7E	5 - 7 pts.
	ERADICANE 6.7E	5 - 7 pts.
	PERMIT 75WDG	2/3 - 1 oz

Comments and cautions: Apply Laddok when Nutsedge is 1-4 inches tall or Basagran when Nutsedge is 6-8 inches tall. Add crop oil concentrate or Dash at 2 pt/A. A second application of Basagran may be made 7-10 days later if needed. Dual should be incorporated to a depth of two inches or less. Use of a light harrow followed by a drag to provide uniform incorporation within 7 days of planting will improve control with Dual. Sutan Plus or Eradicane should be applied to a dry soil surface and incorporated immediately into the top 4 inches of soil. Use higher rates on heavy infestations. Plant no deeper than 2 inches. Apply Permit when nutsedge is 4- 12 inches tall. See comments for Permit in Section VII.

Table 2. NO-TILLAGE CORN SILAGE OR GRAIN

GRAMOXONE EXTRA, RANGER, and ROUNDUP are used for knockdown of existing vegetation but give no residual weed control for annual weed control, a residual herbicide(s) must be used in addition to these materials to control later germiating weeds.

WEED OR CROP SITUATION	PRODUCT AND RATE/ACRE
RYE COVER CROP	ROUNDUP 4L 1 pt. in 10-40 gals. water RANGER 2.7L 1.5 pts. in 5-30 gals. water GROMOXONE EXTRA 2.5L 1-1.5 pts. plus X-77 or equivalent non-ionic surfactant in 10-20 gals. water

Comments and cautions: Apply ROUNDUP or RANGER before rye is 12 inches tall. GRAMOXONE EXTRA should be applied to rye either prior to tillering or after the boot stage.

PLANTING IN PERENNIAL GRASS SODS WITH QUACKGRASS OR RUN-OUT LEGUME STANDS WHICH HAVE BEEN ESTABLISHED FOR THREE OR MORE YEARS	ROUNDUP 4L 4-6 pts. in 10-40 gals. water RANGER 2.7L 5-6 pts. in 5-30 gals. water

Comments and cautions: For best results, apply in the fall. If applied in the spring, apply to hay grasses in the boot stage to early seedhead stage of development. Apply to quackgrass when 8-12 inches tall and actively growing to increase control of either deep-rooted broadleaf weeds like dandelion or for additional control of alafalfa add 1 pt. of 2,4-D AMINE or 0.5 pt. BANVEL plus 0.5- 1% non-ionic surfactant.

EMERGED ANNUAL WEED CONTROL PLANTING INTO CORN STOVER	ROUNDUP 4L 0.5-1 pt. RANGER 2.7L 0.75-1.5 pts. GRAMOXONE EXTRA 2.5L 1.5-3 pts.

Comments and cautions: Use these herbicides only if weeds have emerged prior to planting. Weeds emerging after application will not be controlled. Crop plants emerged at time of application will be killed. Apply to actively growing grass and broadleaf weeds. Apply when weeds are 6 inches or less in height. For GRAMOXONE EXTRA: Use 1.5-2 pts. when weeds are 1-3 inches tall, 2-2.5 pts. when weeds are 3-6 inches tall, and 2.5-3 pts. when weeds are 6 inches tall.

WEED CONTROL TIPS FOR NO-TILL CORN

When switching to no-till corn, changes in weed populations will occur. Weed control strategies must be adjusted to avoid potential weed control disasters. Annual grass weed populations have been observed to increase dramatically after several years of continuous no-till production, especially if grass control is poor. Annual broadleaf weeds such as large-seeded species such as velvetleaf may decrease. Under conventional practices soil tillage stimulates weed seed germination by increasing seed to soil contact and aerating the soil. When herbicides are applied after tillage at planting time the major flush of weeds are exposed to the maximum herbicide concentration. In a no-tillage system, weed seed germination occurs throughout the season.

Weed seeds can germinate after most of the planting time herbicide residues have dissipated in a no-till system. Herbicide treatments that reside longer in the soil provide better full season weed control in no-till corn production. More postemergence weed management treatments may also be necessary. Winter annuals, and biennials weeds usually increase in no-till fields and are controlled effectively with an appropriate burndown treatment. Deep-rooted perennials like bindweed and perennial grasses such as quackgrass can increase. Effective control of these weeds require herbicides which tranlocate to the underground growing points. Many of the new advances in weed control technology will improve weed management for no-till corn production.

Table 3. Corn herbicides and their restrictions- This table is given for informational use only. Endorsement or recommendation of all products listed is not intended.

Trade name	Common name	Restricted-use pesticide[1]	Groundwater advisory[2]
2,4-D 3.8E	2,4-D	-	-
ACCENT 75DF	nicosulfuron	-	-
AATREX, 4L/90DF	atrazine	yes	yes
BANVEL 4S	dicamba	-	-
BASAGRAN 4S	bentazon	-	-
BATTALION 15WG	halosulfuron-methyl	-	-
BEACON 75DF	primisulfuron	-	-
BLADEX 4L/90DF	cyanazine	yes	yes
BUCTRIL 2EC	bromoxynil	-	-
BUCTRIL GEL	bromoxynil	-	-
CLARITY 4S	dicamba	-	-
CROPSTAR 15G	alachlor	yes	yes
DUAL 8E/25G	metolachlor	yes	yes
DUAL II 7.8EC/25G	metolachlor + safener	yes	yes
ERADICANE 6.7E/25G	EPTC + safener	-	-
FRONTIER 6EC/7.5EC	dimethenamid	-	-
GROMOXONE EXTRA 2.5S	paraquat	yes	-
HARNESS 7EC	acetochlor	-	-
LASSO 4EC	alachlor	yes	yes
LASSO II 15G	alachlor	yes	yes
LASSO MT 4ME	alachlor	yes	yes
PARTNER 65WG	alachlor	yes	yes
PENTAGON 60DG	pendimethalin	-	-
PERMIT 75DF	halosulfuron-methyl	-	-
PRINCEP 4L/CALIBER 90	simazine	yes	yes
PROWL 3.3EC	pendimethalin	-	-
PURSUIT 2AS	imazethapyr	-	-
RAMROD 4L/20G	propachlor	-	-
RANGER 2.7L	glyphosate	-	-
RESOURCE 0.86EC	flumiclorac-pentyl	-	-
ROUNDUP 4S	glyphosate	-	-
SENCOR 75DF	metribuzin	-	yes
STINGER 3SC	clopyralid	-	yes
SURPASS 6.4EC	acetochlor	-	-
SUTAN+ 6.7EC	butylate	-	-
TOPNOTCH 3.2EC	acetochlor	-	-
TOUGH 3.75EC	pyridate	-	-
WEEDAR 64 3.8E	2,4-D amine	-	-
WEEDONE 638 2.8E	2,4-D acid	-	-
WEEDONE LV4 3.8E	2,4-D ester	-	-
WEEDONE LV6 5.7E	2,4-D ester	-	-

[1]Only licensed applicator may purcahse and apply restricted-use pesticides. These apply to New England, but some states may have additional restrictions.

[2]These herbicides have an "Environmental Hazard Warning" on their label and have been detected in water supplies from normal agicultural use. Special precautions apply for their use on coarse textured soils or where water tables are shallow. See a herbicide label for specific restrictions.

Table 4. Prepackaged mixtures- Prepackaged mixes of some herbicide combinations are commercially available. This table is provided for informational use. Endorsement or recommendation of the products listed is not intended. The labeled recommended rates of certain mixes may result in application of more atrazine than is needed for most New England soils. Only Only licensed applicators may purchase and apply restricted-use pesticides. These apply to New England, but some states may have additional restrictions.

Commercial product	Common name	Active ingredients	Restricted use pesticide[1]	Groundwater advisory
BANVEL 720 2.9L	dicamba	1.0 lb/gal		
	2,4-D	1.9 lb/gal		
BASIS 75DF	rimsulfuron	50%		
	thifensulfuron-methyl	25%		
BICEP 6L	atrazine	2.67 lb/gal	yes	yes
	metolachlor	3.33 lb/gal		
BICEP LITE 5L	atrazine	1.67 lb/gal	yes	yes
	metolachlor	3.33 lb/gal		
BROADSTRIKE PLUS 85.6WG	clopyralid	62.5%		
	flumetsulam	23.1%		
BROADSTRIKE+DUAL 7.67EC	metolachlor	7.47 lb/gal		
	flumetsulam	0.2 lb/gal		
BRONCO 4E	glyphosate	1.4 lb/gal	yes	yes
	alachlor	2.6 lb/gal		
BUCTRIL + ATRAZINE 3L	bromoxynil	1.0 lb/gal	yes	yes
	atrazine	2.0 lb/gal		
BULLET 4L	alachlor	2.5 lb/gal	yes	yes
	atrazine	1.5 lb/gal		
CONTOUR 3.38SC	imazethapyr	0.38 lb/gal	yes	yes
	atrazine	3.0 lb/gal		
CYCLE 4L	cyanazine	2.0 lb/gal	yes	yes
	metolachlor	2.0 lb/gal		
EXCEED 57WG	prosulfuron	32.3%		
	primisulfuron	32.3%		
EXTRAZINE II 4L	cyanazine	3.0 lb/gal	yes	yes
	atrazine	1.0 lb/gal		
EXTRAZINE 90 DF	cyanazine	67.5%	yes	yes
	atrazine	21.4%		
GUARDSMAN 5L	dimethenamid	2.33 lb/gal	yes	yes
	atrazine	2.67 lb/gal		
HARNESS XTRA 6EC	acetochlor	4.3 lb/gal	yes	yes
	atrazine	1.7 lb/gal		
LADDOK S-12 5F	bentazon	2.5 lb/gal	yes	yes
	atrazine	2.5 lb/gal		
LARIAT 4L	alachlor	2.5 lb/gal	yes	yes
	atrazine	1.5 lb/gal		
MARKSMAN 3.2L	dicamba	1.1 lb/gal	yes	yes
	atrazine	2.1 lb/gal		
PURSUIT PLUS 2.9EC	imazethapyr	0.2 lb/gal		
	pendimethalin	2.7 lb/gal		
RESOLVE 62.5SG	imazethapyr	0.158 lb		
	dicamba	0.467 lb		
SCORPION III 84.3WG	clopyralid	25.0%		
	flumetsulam	9.3%		
	2,4-D	50.0%		
SHOTGUN 3.25FL	atrazine	2.25 lb/gal	yes	yes
	2,4-D	1.0 lb/gal		
SURPASS 100 5L	acetochlor	3.0 lb/gal	yes	yes
	atrazine	2.0 lb/gal		

Table 5. RESISTENCE POTENTIAL OF FIELD CORN HERBICIDES ACCORDING TO MODE OF ACTION[1]

Photosynthetic Inhibitors-High Potential

Triazines

AAtrex, Bladex, Princep

Premixes: Bicep, Bicep II, Bicep Lite, Bicep Lite II, Buctril+Atrazine, Bullet, Cycle, Contour, Extrazine II, Guardsman, Harness Xtra, Laddok S-12, Lariat, Marksman, Shotgun, Surpass 100, Sutazine +

Pyridiliums

Gromoxone Extra

Photosynthetic Inhibitors-Low Potential

Diazinones	Benzonitriles
Basagran , Tough	Buctril

Amino Acid Synthesis Inhibitors- High Potential

ALS Inhibitors

Imidazolinones

Pursuit — Premixes: Pursuit Plus, Contour, Resolve

Sulfonylureas

Accent, Beacon, Permit — Premixes: Exceed, Basis

Sulfonamides

Broadstrike — Premixes: Broadstrike + Dual, Broadstrike Plus, Scorpion III

Amino Acid Synthesis Inhibitors- Low Potential

Amino Acid Derivatives

Phosphonos

Roundup, Liberty

Shoot Inhibitors- Low Potential

Chloroacetamides	Thiocarbamates
Lasso MT, Dual, Frontier. Harness, Surpass	Eradicane , Sutan+

Microtubule Disruptors- Low Potential

Dinitroanalines

Prowl

Growth Hormone Herbicides- Low Potential

Phenoxy Acids

2,4-D — Premixes: Banvel 720

Benzoics	Pyridines
Banvel	Stinger

PPO Inhibitors- Low Potential

N-phenylthalamides

Resource

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[1]The table above lists a number of corn herbicides according to their respective modes of action. The table furthermore divides the herbicides that possess high and low potential to contribute to the development of resistant weeds. An weed is more likely to develop resistance to a herbicide that has a specific site within the plant where it disrupts a particular plant process or function. This table is only provided for informational use.

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